



December 6, 2011

JN: 25-104980.003

County of San Diego  
Department of Planning and Land Use  
**c/o James Pine, County Fire Marshal**  
5201 Ruffin Road, Suite B  
San Diego, CA 92123

Valley Center Fire Protection District  
**George E. Lucia**  
28205 N. Lake Wohlford Road  
Valley Center, CA 92082

**SUBJECT: FIRE PROTECTION PLAN – LETTER REPORT**  
**SOL ORCHARD VALLEY CENTER SOLAR PHOTOVOLTAIC SOLAR**  
**FARM**  
**APN: 188-290-20**

Dear Mr. Pine and Mr. Lucia:

This Fire Protection Plan (FPP) – Letter Report is being submitted pursuant to Chapter 49 of the County Consolidated Fire Code as an evaluation of the adverse environmental effects that a proposed project may have from wildland fire and as mitigation of those impacts to ensure that the above referenced Project does not unnecessarily expose people or structures to a significant risk of loss, injury or death involving wildland fires.

## **PROJECT DESCRIPTION**

The proposed Project would result in the construction, operation and maintenance of a photovoltaic (PV) solar farm within the community of Valley Center, California in northeastern San Diego County. Sol Orchard LLC proposes to develop such facilities to allow for the long-term generation of clean energy from solar power that would ultimately be sold and distributed for public consumption.

The proposed facilities would have an overall production capacity of 7.5 Megawatts (MW) (alternating current – AC). The Project is expected to supply roughly 30-90 percent of power delivered to the Valley Center area, depending on the time of day. No export to transmission is anticipated.

The proposed PV solar facilities would be installed on a privately owned portion of a 55-acre parcel located at 15155 Vesper Road, bordered by Vesper Road to the north and Valley Center Road to the south, between Almona Way to the west and Mac Tan Road to the east, otherwise known as County Assessor Parcel Number (APN) 188-290-20. Development and MUP authority

**PLANNING ■ DESIGN ■ CONSTRUCTION**

9755 Clairemont Mesa Boulevard, Suite 100, San Diego, CA 92124 ■ 858.614.5000 ■ Fax 858.614.5001

Offices located throughout California, Arizona & Nevada ■ [www.RBF.com](http://www.RBF.com)

would be limited to approximately 46 acres of the parcel, allowing the unaffected acreage to generally remain in its present state (single-family residential use with supporting outbuildings, with exception of removal of an existing mobile home).

The facilities would consist of a 46-acre solar energy system on approximately 55 acres within Valley Center area of the Unincorporated County of San Diego. The solar panels are proposed to be single-axis rotating panels. Energy generated by the Project would be delivered to an existing 12 kV distribution line that runs parallel to Valley Center Road. Connection would be made from the Project site either via trench under Valley Center Road.

Primary access to the site would occur from the north via Vesper Road. The project would include a series of 24 foot roads surrounding the perimeter of the project as well as 20 foot roads spaced throughout the solar racking systems to adequately perform maintenance. The on-site roads are proposed to remain a permeable surface and would not be paved. The entire solar farm area would be fenced to limit human access. See Exhibit 3, Major Use Permit Plot Plan (attached).

It is anticipated that construction would begin in the second quarter of 2012 and be in full operation in the fourth quarter of 2012.

## ENVIRONMENTAL SETTING

**1. Location:** The Project site is located at 15155 Vesper Road, just east of the community of Valley Center, within north central San Diego County, California (refer to Exhibits 1 and 2, Regional and Local Vicinity Maps). The County APN that comprises the Project area for the main facilities is 188-290-20 totaling 54 acres, owned by Sol Orchard LLC.

**2. Topography:** The overall topography of the site is flat agricultural lands with a gentle descent from elevation 1,450 in the northeast corner to approximately 1,410 in the southwest corners. There are no slopes, hilltops or ridgeline. There is one earth lined drainage ditch that runs parallel to Valley Center Road.

**3. Geology:** Approximately 75% of the site is Visalia sandy loam in the northern portions of the site, and some Clayey alluvial and Placentia sandy loam in the southern areas. The site does not contain geological features that would pose any increased danger of wildfire potential or human safety issues.

**4. Flammable Vegetation:** Vegetation on the project site consists of a range of urban developed, disturbed habitat, intensive irrigated agricultural, orchard and row crops. These and surrounding vegetation and development types pose a minimal fire hazard. (See Exhibit 4, Biological Resources Map.) Conversations with the Fire Chief indicate that the area is in a hazardous wildland fire area.

**5. Climate:** Valley Center, CA climate is warm during summer when temperatures tend to be in the 70's and cool during winter when temperatures tend to be in the 50's. The warmest month of the year is August with an average maximum temperature of 89 degrees Fahrenheit, while the coldest month of the year is December with an average minimum temperature of 42 degrees Fahrenheit. Temperature variations between night and day tend to be moderate during summer with a difference that can reach 27 degrees Fahrenheit, and moderate during winter with an average difference of 25 degrees Fahrenheit. The annual average precipitation at Valley Center is 15.10 Inches. Rainfall in is fairly evenly distributed throughout the year. The wettest month of the year is January with an average rainfall of 3.37 inches.

## PROJECT EXPOSURE TO WILDLAND FIRES

**1. Water Supply:** The project site has water service and is fully irrigated for agricultural uses. Fire hydrants are located on Vesper Road near the entrance to the site and on Valley Center Road. Onsite landscaping will be watered via well and municipal water. Water for washing the panels will be provided by the existing meter connected to Vesper Road. A commercial vendor will arrive on-site, load water from the meter, de-ionize the water, and wash the panels. A copy of the Fire Service Availability Form is attached to this FPP – Letter Report.

**2. Fire Access Roads:** Access to the project site would occur from the north via Vesper Road. The project would include a looped 24-foot wide all-weather roads system capable of supporting 75,000-lb. fire apparatus surrounding the perimeter of the project. In addition, a system of internal roadways, 24 feet in width, would be provided every 300 feet between the blocks of the PV solar panels (approximately 150 feet to either side) for emergency access. Additional roads are also proposed within the MUP area to adequately perform maintenance. A fence would surround the solar farm site to limit human access.

*Access to Multiple Evacuation Routes:* Interior access would be provided by a series of 24-foot wide emergency access roads every 300 feet between the blocks of PV solar panels (approximately 150 feet to either side). The roads would be surfaced with DG and would serve as a fire buffer.

*Dead Ends:* No dead-end roadways are proposed.

*Width:* The improved width of the access looped perimeter road(s) would be 24 feet with a decomposed granite base suitable for travel by 75,000-lb. fire apparatus.

*Vertical Clearance:* A minimum vertical clearance of 13'-6" shall be maintained at all times along the access driveways including brush/tree maintenance in conjunction with the County Fire Code. Currently, there are no vertical obstructions along the access road.

*Grade:* A maximum 10% grade would be maintained along all access roads.

*Surface:* Surface improvements shall consist of a natural and all-weather DG material design and shall be constructed and approved by the County of San Diego and Valley Center Fire Protection District. All DG material shall be compacted per County standards suitable for travel by 75,000-lb. fire apparatus.

*Gates:* Gates are proposed at the Vesper Road entrance to provide secured access to the Project site. Gates off of the central access road would be provided to fire access roads to the solar facilities. The gates would meet the County Fire Code Section 96.1.503.6 for automatic operation with battery back-up. The gate would open immediately upon emergency vehicle strobe light activation from either direction of approach and would include a Knox-box key-operation switch. A cul-de-sac or hammerhead turnaround shall be provided as noted above.

**3. Setback from Property Lines:** The minimum setbacks as regulated by the County of San Diego Zoning Ordinance Section 4800 would be maintained. A schedule summarizing the specific zoning designation for each property is as follows:

## ZONING

ZONE		
USE REGULATIONS		A70
NEIGHBORHOOD REGULATIONS		L
DEVELOPMENT REGULATIONS	DENSITY	0.5
	LOT SIZE	2 AC
	BUILDING TYPE	C
	MAXIMUM FLOOR AREA	--
	FLOOR AREA RATIO	--
	HEIGHT	G
	LOT COVERAGE	--
	SETBACK	C
SPECIAL AREA REGULATIONS		--

The Project meets the minimum 60-foot setbacks from Vesper and Valley Center Roads and the minimum 15-foot setbacks from the side lot lines (eastern and western property lines). The entire Project site perimeter would be covered by a 30-foot wide Limited Building Zone (LBZ) and fire access road.

**4. Building Construction:** Building construction for on-site structures would be limited to non-combustible construction primarily of concrete, block or steel. Project structures would consist of 7 inverters in three (3) pad locations on the site to conduct the Direct Current obtained from the PV units into Alternating Current, which would then be transferred from the inverters via underground lines to the point of interconnect on the southside of Valley Center Road. No other structures are proposed (no control rooms, substations or storage buildings).

**5. Fire Protection Systems:** The existing residence and outbuildings in the center of the site would remain. No habitable structures are proposed on the Project site.

**6. Defensible Space:** No defensible space is proposed for the Project; however, a 30-foot perimeter buffer defensible space would be constructed around the parcel and classified as a LBZ. Furthermore, there would be a 24-foot DG all-weather access road within the 30-foot LBZ to allow for fire/emergency apparatus to navigate the site.

**7. Vegetation Management:** On-site vegetation would be maintained/weed-whipped yearly unless otherwise requested by the County of San Diego or the Valley Center Fire Protection District. All vegetation within the array will be maintained to a maximum height of six (6) inches. A minimum of 30-foot clearance would be maintained around the perimeter of Project site. The existing residential buildings would remain, and already have 100-foot fire management zones. The LBZ shall be maintained year-round by the Project proponent as required by this FPP Letter Report and local fire regulations (VCFPD). Vegetation shall be annually maintained free of dead material.

**8. Fire Behavior Computer Modeling:** Based on preliminary evaluation by the County Fire Marshal, Computer Fire Behavior Modeling is not required for this FPP – Letter Report.

**9. Signage:** An illuminated directory sign will be located at the entrance of the facility at Vesper Road. The signage will depict the overall site plan and the locations of each numbered inverter structure. Each inverter structure shall be numbered and signed to be visible from at least 1,000 feet. The phone number of the responsible entity who can dispatch a local PV technician in a timely manner shall be displayed on the lighted directory and on each inverter structure.

**10. Disconnects:** The PV arrays will be arranged in blocks with disconnects for each block of PV arrays located at the inverter structures. Though utilization of the disconnect will disrupt all

AC power leaving the inverter structure, the PV arrays and all DC powerlines will still be energized during the daytime Cut off switches to be approved by the Fire Authority.

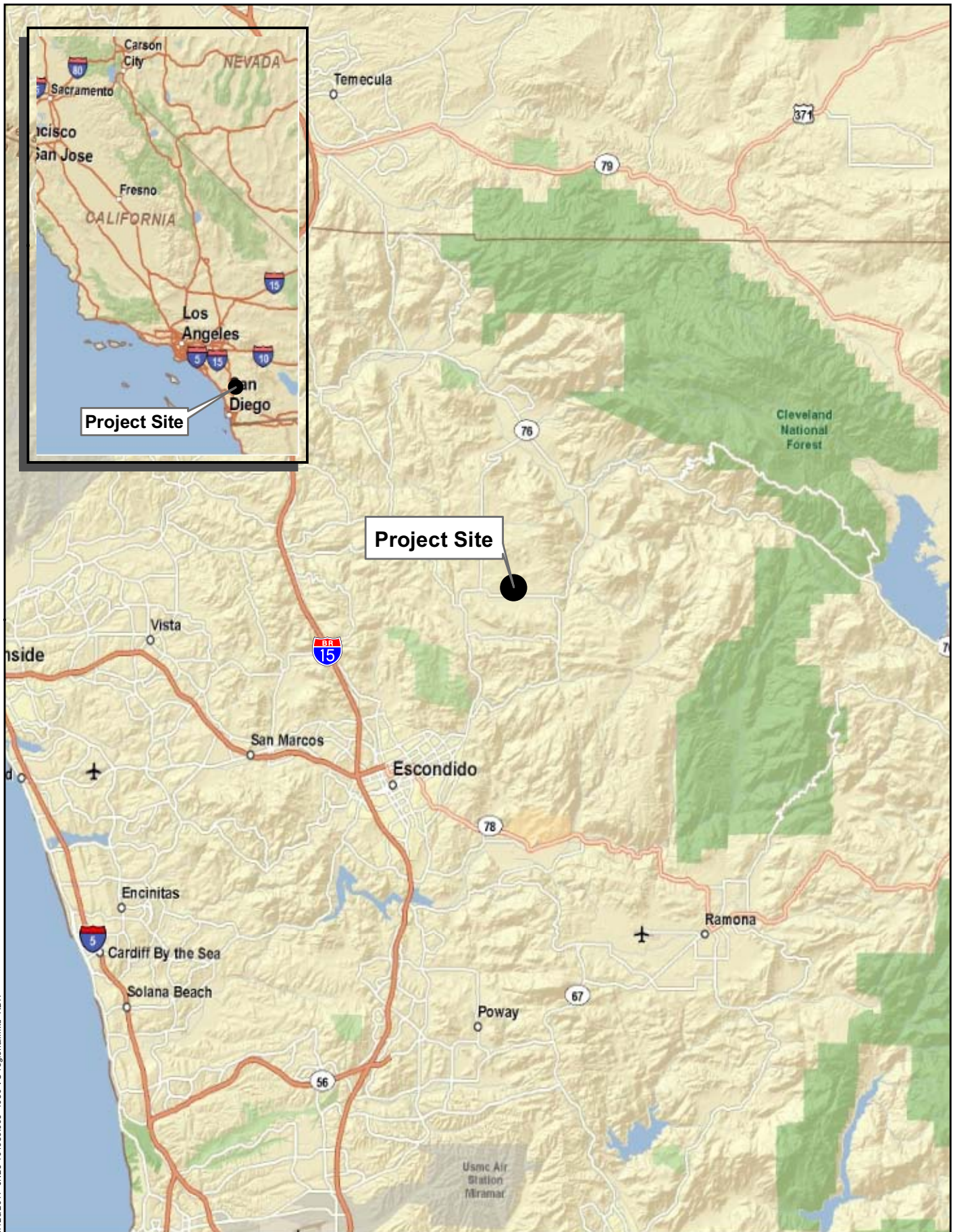
_____	12/06/11	Stephanie Cheng, Planner
Prepared by	Date	Printed Name, Title

_____	12/06/11	Steve Wragg, Vice President
Property Owner (Signature)	Date	Printed Name, Title

Attachments: Exhibits 1, 2, 3, and 4; Fire Service Availability Form;  
Wildfire Technical Report

h:\pdata\25104980\003-valleycenter\admin\reports\fire protection plan\4980 fpplr 10-19-11.docx





07/29/2011 JN25-104980.003 4980-VC-regional.mxd RDH

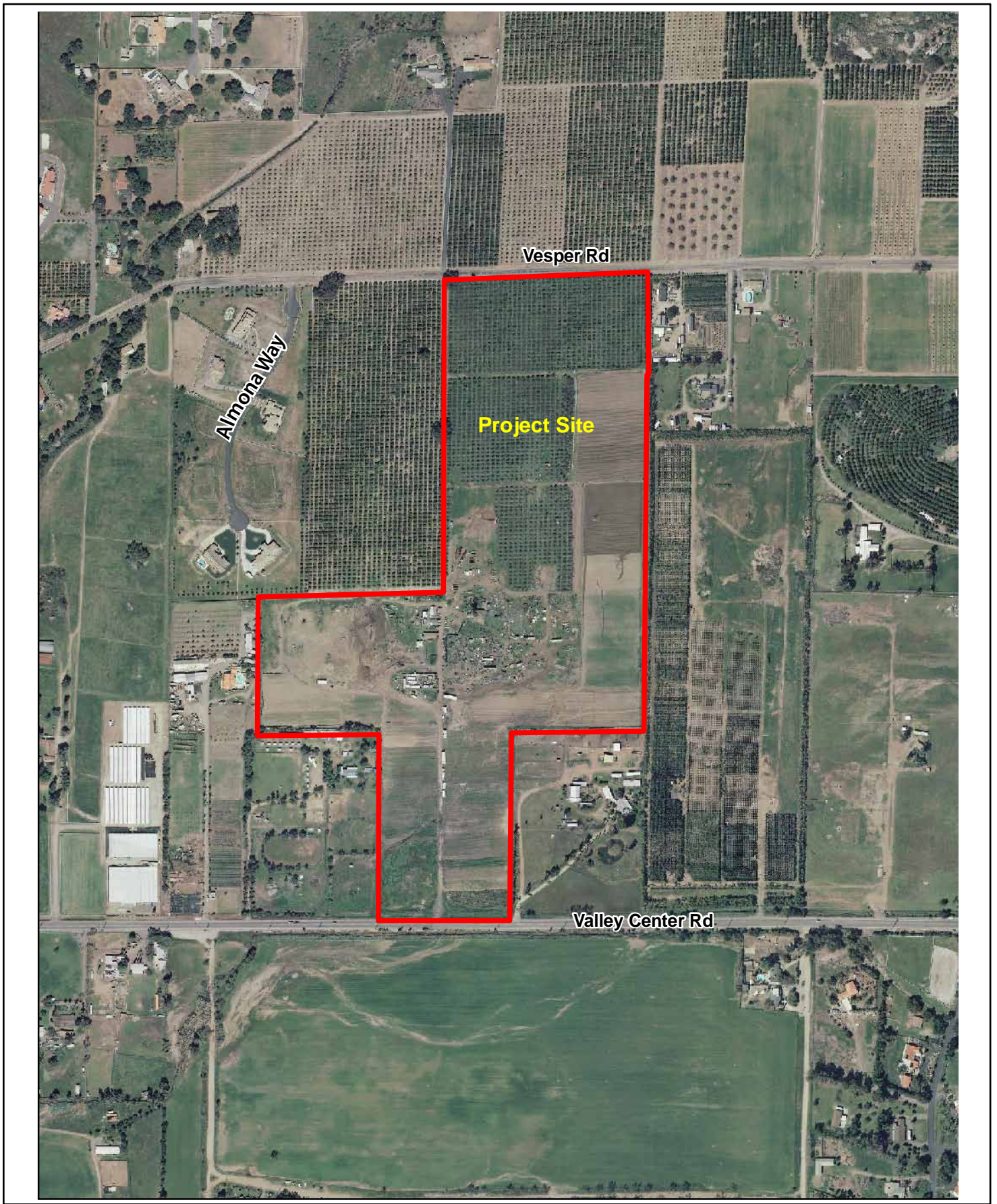


Source: ESRI

0 2.5 5 10 Miles

# SOL ORCHARD-VALLEY CENTER Regional Location Map





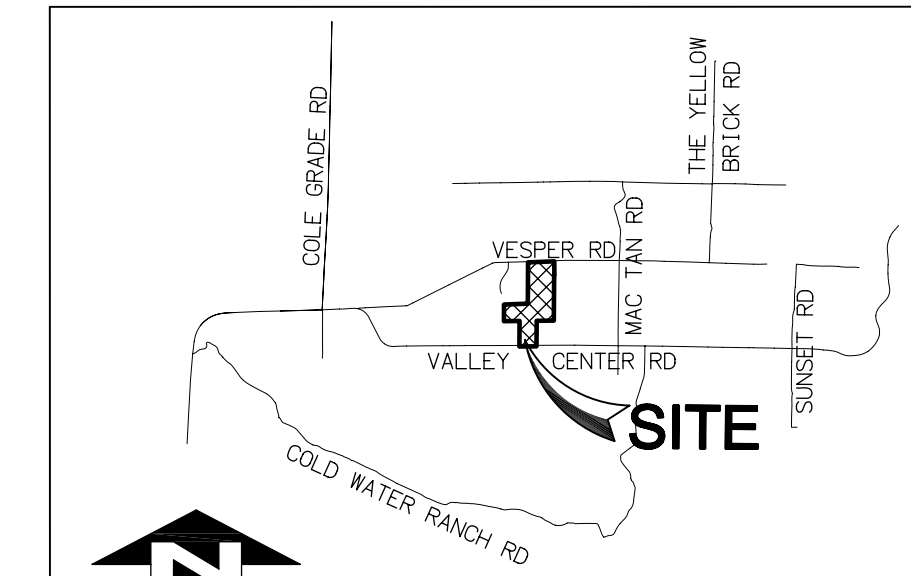


LEGEND  
MAJOR USE AREA  
30' FUEL MODIFICATION ZONE  
\*100' FMZ FOR EXISTING STRUCTURES

LIMITS OF MAJOR USE AREA & FUEL MODIFICATION ZONE  
SCALE: 1"=300'

LEGEND:  
PROPERTY BOUNDARY  
MAJOR USE PERMIT BOUNDARY  
EXISTING EASEMENT  
ZONING ORD. SETBACK LINE  
EX. FENCE  
PROP. 6' CHAINLINK FENCE WITH 2 STRAND BARBED WIRE  
PROPOSED ACCESS GATE (24')(9)  
EX. DG ROAD (18'-22')  
EX. PAVEMENT  
PROP. 24' DG FIRE ACCESS ROAD-ALL WEATHER (10% MAX)  
EX. SFD/OUT BUILDINGS  
EX. OVERHEAD POWERLINE  
PROP. INTERCONNECT UNDERGROUND  
EX. POWER POLE  
EX. FIRE HYDRANT  
EX. WATER METER  
EX. WATER WELL (5)  
PROP. INVERTER/TRANSFORMER PLATFORM (7)  
PROP. PV PANEL (MONO/POLYCRYSTALLINE) BLOCK SINGLE AXIS TRACKER

ZONING	
ZONE	A70
USE REGULATIONS	L
NEIGHBORHOOD REGULATIONS	L
DENSITY	0.5
LOT SIZE	2 AC
BUILDING TYPE	C
FLOOR AREA RATIO	---
HEIGHT	G
LOT COVERAGE	---
SETBACK	C
OPEN SPACE	---
SPECIAL AREA REGULATIONS	---



VICINITY MAP  
NOT TO SCALE

#### EXISTING EASEMENTS\*

DESCRIPTION	DISPOSITION
SDGME EASEMENT	A PORTION TO REMAIN
PRIVATE 12' ROAD EASEMENT	TO REMAIN

#### PROPOSED EASEMENTS

DESCRIPTION
15' TRAIL EASEMENT

#### NOTES

- GROSS AREA: 54.6 ACRES  
NET AREA: 53.3 ACRES
- MUP AREA: 46.1 ACRES
- TOPOGRAPHIC SOURCE: INTERMAP, FLOWN 2005
- ASSOCIATED REQUESTS: NONE
- THE APPROVAL OF THIS MAJOR USE PERMIT (MUP) AUTHORIZES THE FOLLOWING: CONSTRUCTION, OPERATION, AND MAINTENANCE OF AN UNMANNED PHOTOVOLTAIC SOLAR FARM PURSUANT TO SECTION 6952, OF THE SAN DIEGO COUNTY ZONING ORDINANCE.
- THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMIT BEFORE COMMENCING SUCH ACTIVITY, IF REQUIRED.
- ALL PROPOSED STRUCTURES TO BE CONSTRUCTED OF NON-COMBUSTIBLE MATERIALS (CONCRETE, BLOCK, METAL) OR SIMILAR.
- LANDSCAPING PROPOSED SEE SHEET 3.
- LIGHTING FOR MAINTENANCE AND SECURITY PROPOSES ONLY. SHIELDED LIGHTING LOCATED AT GATES AND SHALL CONFORM TO COUNTY OF SAN DIEGO OUTDOOR LIGHTING REQUIREMENTS. SEE DETAIL ON SHEET 2.
- PHASING - PROJECT MAY BE IMPLEMENTED IN SEVERAL PHASES WITHOUT REGARD TO SEQUENCE.
- ALL DISTURBED AREAS WITHIN MUP AREA WOULD BE COVERED WITH GRAVEL OR A PERMEABLE BINDING AGENT TO REDUCE DUST.
- NO GRADING PROPOSED.
- NO SIGNAGE PROPOSED, EXCEPT FOR DIRECTIONAL AND SAFETY SIGNAGE.
- EXISTING SINGLE FAMILY AND 3 OUT BUILDING LOCATED OUTSIDE OF MUP AREA. PROJECT ACCESS FROM VESPER ROAD.
- ALL SITE ACCESS GATES TO BE EQUIPPED WITH FIRE DEPARTMENT APPROVED STROBE LIGHT ACTIVATION AND KNOX KEY-OPERATED SWITCH.
- THE SOLAR RELATED FACILITIES (PANELS, RACKING, ELECTRICAL CONNECTIONS, INVERTER STRUCTURES, FENCING AND INTERNAL ACCESS, ETC.) SHOWN ON THIS PLOT PLAN MAY BE RELOCATED, RECONFIGURED, AND/OR RESIZED WITHIN THE SOLAR FACILITY DEVELOPMENT AREA WITH THE ADMINISTRATIVE APPROVAL OF THE DIRECTOR OF DPLU WHEN FOUND IN CONFORMANCE WITH THE INTENT AND CONDITIONS OF PERMIT'S APPROVAL.
- WATER DISTRICT: VALLEY CENTER MUNICIPAL WATER DISTRICT.
- FIRE DISTRICT: VALLEY CENTER FIRE PROTECTION DISTRICT.
- GENERAL PLAN DESIGNATION: SEMI-RURAL RESIDENTIAL 4 (SR-4).
- LANDSCAPING TO BE WATERED VIA EXISTING ON-SITE WELLS.

#### COVERAGE SUMMARY

DESCRIPTION	ACREAGE
BUILDING & TRANSFORMER PADS	0.06
PV PANELS	15.37
TOTAL	15.43

#### ASSESSOR PARCEL NUMBER/TAX RATE AREA

188-290-20 TRA 94075

#### LEGAL DESCRIPTION

THAT PORTIONS OF THE SOUTHWEST QUARTER OF SECTION 8, TOWNSHIP 11 SOUTH, RANGE 1 WEST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA

#### APPLICANT/OWNER:

SOL ORCHARD LLC  
PO Box 222416,  
Coronel, CA 93923,  
(831) 659-8200  
CONTACT: WILL PRICHARD

#### SHEET INDEX

SHEET 1 - TITLE SHEET/PLOT PLAN  
SHEET 2 - ELEVATIONS/DETAILS  
SHEET 3 - LANDSCAPE PLAN

## SOL ORCHARD - VALLEY CENTER PHOTOVOLTAIC SOLAR FARM COUNTY OF SAN DIEGO, CA MAJOR USE PERMIT

TITLE SHEET / PLOT PLAN  
DEC. 6, 2011  
SHEET 1 OF 3



PLANNING DESIGN CONSTRUCTION  
9755 CLAREMONT MEESA BOULEVARD, SUITE 100  
SAN DIEGO, CALIFORNIA 92124-324  
951.914.5000 FAX 951.914.5001 WWW.RBF.COM

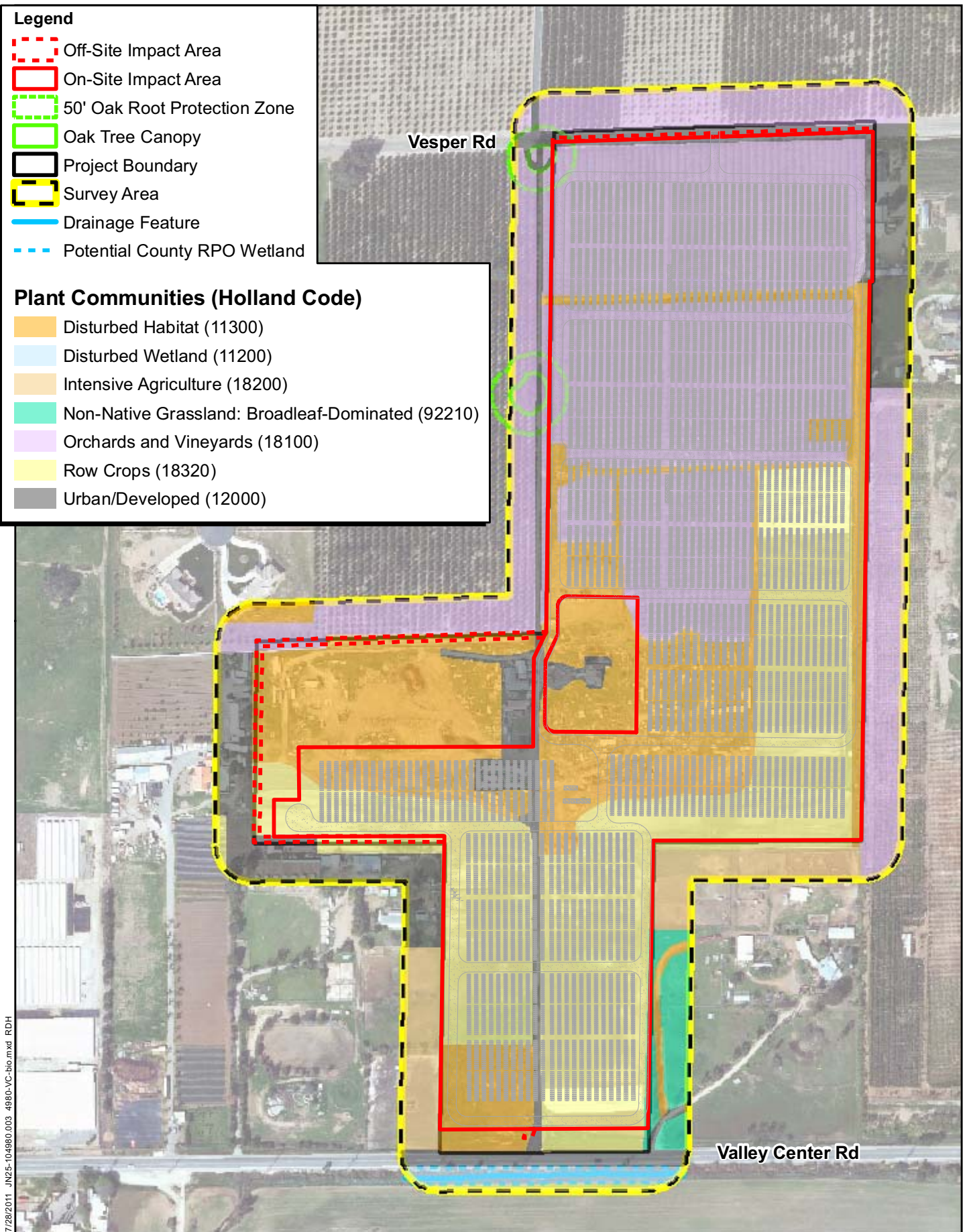


## Legend

- Off-Site Impact Area
- On-Site Impact Area
- 50' Oak Root Protection Zone
- Oak Tree Canopy
- Project Boundary
- Survey Area
- Drainage Feature
- Potential County RPO Wetland

## Plant Communities (Holland Code)

- Disturbed Habitat (11300)
- Disturbed Wetland (11200)
- Intensive Agriculture (18200)
- Non-Native Grassland: Broadleaf-Dominated (92210)
- Orchards and Vineyards (18100)
- Row Crops (18320)
- Urban/Developed (12000)



07/28/2011 JN25-104880.003 4880-VC-bio.mxd RDH



250 125 0 250 Feet

Source: Eagle Aerial 3-2010, RBF Consulting

## SOL ORCHARD-VALLEY CENTER Biological Resources Map



**COUNTY OF SAN DIEGO**  
**DEPARTMENT OF PLANNING AND LAND USE: Zoning**  
**PROJECT FACILITY AVAILABILITY FORM, Fire**

<i>Please type or use pen</i>			<b>F</b>
Sol Orchard LLC	831-659-8200	ORG _____	
Owner's Name	Phone	ACCT _____	
P.O. 222416		ACT _____	
Owner's Mailing Address	Street	TASK _____	
Carmel	CA 93923	DATE _____ AMT \$ _____	
City	State	Zip	
<b>DISTRICT CASHIER'S USE ONLY</b>			

**SECTION 1. PROJECT DESCRIPTION**

**TO BE COMPLETED BY APPLICANT**

- A. ☐ Major Subdivision (TM) ☐ Specific Plan or Specific Plan Amendment  
☐ Minor Subdivision (TPM) ☐ Certificate of Compliance: \_\_\_\_\_  
☐ Boundary Adjustment  
☐ Rezone (Reclassification) from \_\_\_\_\_ to \_\_\_\_\_ zone.  
☒ Major Use Permit (MUP), purpose: PV Solar Project  
☐ Time Extension... Case No. \_\_\_\_\_  
☐ Expired Map... Case No. \_\_\_\_\_  
☐ Other \_\_\_\_\_
- B. ☐ Residential . . . . . Total number of dwelling units \_\_\_\_\_  
☐ Commercial . . . . . Gross floor area \_\_\_\_\_  
☐ Industrial . . . . . Gross floor area \_\_\_\_\_  
☒ Other . . . . . Gross floor area n/a
- C. Total Project acreage 53.8 Total lots n/a Smallest proposed lot n/a

Assessor's Parcel Number(s)  
(Add extra if necessary)

188-290-20	

Thomas Bros. Page 1090 Grid H1  
15155 Vesper Road  
Project address \_\_\_\_\_ Street \_\_\_\_\_  
Valley Center 92082  
Community Planning Area/Subregion \_\_\_\_\_ Zip \_\_\_\_\_

**OWNER/APPLICANT AGREES TO COMPLETE ALL CONDITIONS REQUIRED BY THE DISTRICT.**

Applicant's Signature: [Signature] Date: July 21, 2011  
Address: 9755 Clairemont Mesa Bl. Ste 100, San Diego, CA 92124 Phone: 858-614-5059  
(On completion of above, present to the district that provides fire protection to complete Section 2 and 3 below.)

**SECTION 2: FACILITY AVAILABILITY**

**TO BE COMPLETED BY DISTRICT**

- District name Valley Center Fire Protection District
- Indicate the location and distance of the primary fire station that will serve the proposed project: VCFPD STATION # 73  
AT 28205 N. Lane Wohlford RD - 2.2 miles / 4 minutes
- A. ☒ Project is in the District and eligible for service.  
☐ Project is not in the District but is within its Sphere of Influence boundary, owner must apply for annexation.  
☐ Project is not in the District and not within its Sphere of Influence boundary.  
☐ Project is not located entirely within the District and a potential boundary issue exists with the \_\_\_\_\_ District.
- B. ☐ Based on the capacity and capability of the District's existing and planned facilities, fire protection facilities are currently adequate or will be adequate to serve the proposed project. The expected emergency travel time to the proposed project is \_\_\_\_\_ minutes.
- ☒ Fire protection facilities are not expected to be adequate to serve the proposed development within the next five years.
- C. ☐ District conditions are attached. Number of sheets attached: \_\_\_\_\_  
☒ District will submit conditions at a later date.

**SECTION 3. FUELBREAK REQUIREMENTS**

**Note: The fuelbreak requirements prescribed by the fire district for the proposed project do not authorize any clearing prior to project approval by the Department of Planning and Land Use.**

- ☒ Within the proposed project 100 feet of clearing will be required around all structures.  
☒ The proposed project is located in a hazardous wildland fire area, and additional fuelbreak requirements may apply. Environmental mitigation requirements should be coordinated with the fire district to ensure that these requirements will not pose fire hazards.

This Project Facility Availability Form is valid until final discretionary action is taken pursuant to the application for the proposed project or until it is withdrawn, unless a shorter expiration date is otherwise noted.

Authorized signature: [Signature] Print name and title: George E. Lucio Phone: 760 757 7600 Date: 7-25-11

On completion of Section 2 and 3 by the District, applicant is to submit this form with application to:  
Zoning Counter, Department of Planning and Land Use, 5201 Ruffin Road, Suite B, San Diego, CA 92123





# APPENDIX 'A'

## SOL ORCHARD – VALLEY CENTER PHOTOVOLTAIC SOLAR FARM

### *Wildfire Technical Report*

**Prepared By:**

C. Douglas Pumphrey  
Senior Wildland Fire Associate  
**FIREWISE 2000, Inc.**  
951-315-2030  
dp.firewise2000@sbcglobal.net

Certified by: David C. Bacon

David C. Bacon, President  
**FIREWISE 2000, Inc.**  
26337 Sky Drive  
Escondido, CA 92026  
Telephone: 760-745-3947  
Fax: 760-557-2301  
firewise2000@sbcglobal.net

Date: December 6, 2011

## **APPENDIX 'A'**

### **SOL ORCHARD – VALLEY CENTER PHOTOVOLTAIC SOLAR FARM Wildfire Technical Report**

#### **Table of Contents**

- 1. INTRODUCTION**
- 2. BACKGROUND**
  - A. Project Location**
  - B. Proposed Project**
- 3. ANALYSIS**
  - A. Solar Farm Effects on Fire Risk**
  - B. Hazards to Emergency Responders**
  - C. Protection of the Project Site from Off-Site Wildland Fire Exposure**
- 4. FIRE OPERATIONS AND TACTICS FOR PHOTOVOLTAIC SYSTEMS**
  - A. Strategy**
  - B. Tactics**
    - 1) Firefighter Electrical Safety**
    - 2) Trip, Slip or Fall Hazards**
    - 3) Firefighter Inhalation Hazards**
    - 4) Battery Hazards**
- 5. SUMMARY**
- REFERENCES**



## **Sol Orchard-Valley Center Photovoltaic Solar Farm Technical Report**

### **1. INTRODUCTION**

The Valley Center Solar Farm Project is to allow for the installation and operation of a photovoltaic (PV) electrical generation facility. It represents an opportunity to provide residents of Valley Center and the greater surrounding area with clean source of electrical power from renewable sources that would supplement energy currently supplied by the existing power grid. This would thereby reduce the potential for power shortages to occur and decrease demands on the capabilities of the existing distribution solar farm.

### **2. BACKGROUND**

#### **A. Project Location**

The project site is located at 15155 Vesper Road, just east of the community of Valley Center within north central San Diego County, California (refer to Exhibits 1 and 2, Regional and Local Vicinity Maps, in this Fire Protection Plan [FPP] – Letter Report). Primary access to the site would occur from the north via Vesper Road. The site for the main facilities is located in County APN 188-290-20 totaling 54 acres, owned by Sol Orchard LLC.

#### **B. Proposed Project**

The proposed project would result in the construction, operation and maintenance of a photovoltaic (PV) solar farm within the community of Valley Center, California in northeastern San Diego County. Sol Orchard LLC proposes to develop such facilities to allow for the long-term generation of clean energy from solar power that would ultimately be sold and distributed for public consumption.

The proposed facilities would have an overall production capacity of 7.5 Megawatts (MW) (alternating current – AC). The project is expected to supply roughly 30-90 percent of power delivered to the Valley Center area, depending on the time of day. No transmission export is anticipated.

The proposed PV solar facilities would be installed on a privately owned portion of a 54-acre parcel located at 15155 Vesper Road, bordered by Vesper Road to the north and Valley Center Road to the south, between Almona Way to the west and Mac Tan Road to the east. Development and MUP authority would be limited to approximately 45 acres of the parcel, allowing the unaffected acreage to generally remain in its present state (single-family

residential use with supporting outbuildings, with exception of removal of an existing mobile home).

The facilities would consist of a 46-acre solar energy system on approximately 54 acres within Valley Center area of the Unincorporated County of San Diego. The solar panels are proposed to be single-axis rotating panels. Energy generated by the project would be delivered to an existing 12 kV distribution line that runs parallel to Valley Center Road. Connection would be made from the project site either via trench under Valley Center Road.

Primary access to the site would occur from the north via Vesper Road. The project would include a series of 24 foot roads surrounding the perimeter of the project as well as 20 foot roads spaced throughout the solar racking systems to adequately perform maintenance. The on-site roads are proposed to remain a permeable surface and would not be paved. The entire solar farm area would be fenced to limit human access.

Construction is anticipated to begin in the second quarter of 2012 and be in full operation in the fourth quarter of 2012.

### **3. ANALYSIS**

The Fire Protection Plan – Letter Report evaluates and recommends actions for the proposed Valley Center Solar Project to ensure it does not unnecessarily expose people or structures to fire risks and hazards. The FPP identifies and prioritizes the measures necessary to adequately mitigate those impacts. It considers the property location, topography, geology, flammable vegetation (fuel types), and climatic conditions. It also considers the water supply, fire access roads, setbacks from the property lines, structure ignitability and fire resistive building materials, fire protection systems, defensible space, and vegetation management.

The primary purpose of this Technical Report is to identify pre-suppression actions that would reduce risk directly associated with the solar farm, actions that would protect and enhance the safety of fire suppression resources, and actions that could protect the solar farm from ignition caused by other sources.

Today's emergency responders face unexpected challenges as new uses of alternative energy increase. These renewable power sources save on the use of conventional fuels such as petroleum and other fossil fuels, but they also introduce unfamiliar hazards that require new fire fighting strategies and procedures.

The safety of firefighters and other emergency first responder personnel depends on understanding and properly handling these hazards through adequate training and preparation. The goal of this report is to assemble core principle and best practice information for



firefighters, fire ground incident commanders, and other emergency first responders to assist in their decision making process at emergencies involving solar farms.

#### **A. Solar Farm Effects on Fire Risk**

The primary objective of this report is to identify the potential hazards resulting from the installation, operation and maintenance of the Valley Center Solar Farm. These hazards include several operations and activities associated with the solar farm that could elevate the probability of ignition. These could include the following:

- 1) Transmission lines contacting vegetation that could cause an ignition, especially when excessive electrical load demands cause line sag,
- 2) Maintenance activities such as welding or vegetation clearing along the lines that could cause an ignition,
- 3) Vehicles used by the solar farm operations that could cause an ignition (catalytic converter, faulty brakes, etc.), and
- 4) Malfunctioning transformers at a switchyard that could create an ignition.

#### **B. Hazards to Emergency Responders**

- 1) Stepping on, sitting on, or walking on and around PV racking solar farms, conduit and the modules themselves.
- 2) During daylight hours emergency response crews must consider a PV solar farm energized.
- 3) PV solar farms are unique in that components may remain energized within the facilities even after all utility supplied power has been de-energized.
- 4) Depending on the level of damage to the solar farm during a fire incident, the connection to “ground” may have been lost and create an extremely hazardous situation, especially if pooling of water occurs.
- 5) The use of electrical conductive tools is hazardous since the modules and frames may still be energized.
- 6) Burning PV modules produce toxic vapors.
- 7) The inverters and dc combiner boxes are in the inverter structures and present very hazardous conditions for emergency responders. The proposed structures for this solar farm would consist of 7 inverters in three pad locations on the site to conduct the direct current produced by the PV units into alternating current, which would then be transferred from the inverters via underground lines to the point of interconnect on the south side of Valley Center Road. Depending on the design and manufacturer, these components could be located at various locations on the inverter structure.

- 8) There could be a delay in locating the inverters or identifying other controls if not properly signed.
- 9) Depending on the level of damage to the solar farm, the connection to “ground” may have been lost.

### **C. Protection of the Project Site from Off-Site Wildland Fire Exposure**

The Valley Center PV solar farm is in a very high fire hazard severity zone. The FPP for this solar farm documents recommendations to protect the facilities from fire from other sources. Any wind or topography driven wildfire burning under a northeast (*Santa Ana*) wind pattern creates a very high wildland fire hazard scenario, especially for wildland fires starting northeast of the development. In addition, a typical fire day with a southwest wind will create a high wildland wildfire hazard. However, the proposed fuel modification and maintenance, “*firewise*” landscaping, and the use of building standards compatible with a solar operation will lower the risk for potential loss of solar structures to less than significant levels. Fuel treatment and setback will also eliminate direct fire impingement and radiant heat from around the perimeter of the structures.

## **4. FIRE OPERATIONS AND TACTICS FOR PHOTOVOLTAIC SYSTEMS**

Following a size-up of a fire incident, the choice of a strategic mode should be made by the Incident Commander (IC) following normal fire department standard operating procedures (SOPs). Tactics like strategy should also be based upon normal standard operating procedures for responding to an emergency incident at a PV solar farm.

### **A. Strategy**

When a fire incident occurs in the vicinity or within a PV solar farm, the following items must be considered in developing a strategy:

- 1) Fire conditions found on arrival,
- 2) Whether the PV solar farm itself is burning or fire is confined to the surrounding vegetation,
- 3) Threatened exposures including wild land areas, and
- 4) Water and additional resources available.

Once the IC has completed a size-up, he/she should determine the strategy and assign tasks to the fire suppression resources assigned to the incident. Due to the hazards associated with PV solar farms, the IC must adjust the strategy and potentially rearrange the order of the tactics to deal specifically with the PV solar farm technology. If the IC chooses an

offensive strategy, it needs to be supported as any other fire operation, with an emphasis on disabling all power sources to and from the PV solar farm.

## B. Tactics

It is very important that all fire emergency responders understand the hazards and related factors necessary for fire operations involving photovoltaic sites. For solar farms located within the Deer Springs Fire Protection District (DSFPD), all emergency responders must be trained for the following:

- Ability to recognize PV systems
- Ability to identify system locations
- Ability to identify hazards with PV systems
- Ability to perform size up
- Have knowledge of strategies and tactics

Operating at incidents where PV systems are present may require firefighters to adjust their actions somewhat; however, these adjustments should be similar to those that are necessary with many other types of electrical equipment or power generating sources.

The primary danger to firefighters working around a PV system is electrical shock. Following are the hazards and recommendations for fire fighting tactics for a solar farm site.

### 1) Firefighter Electrical Safety

- a. “Components are always hot!” The single most critical message of emergency response personnel is to always consider photovoltaic solar farms and all their components as electrically energized. The inability to power-down photovoltaic panels exposed to sunlight makes this an obvious hazard during the daytime. A potential concern would also be present at nighttime for a solar farm if equipped for battery storage. However, this proposed solar farm will not use batteries.

All hazards should be appropriately marked or barricaded.

- b. Provide ability for electrical solar farm isolation for emergency responders. A key task by emergency response personnel is the isolation or shutdown of electrical power. This is especially important for this commercial solar farm which generates high levels of electricity and poses significant fire-fighting challenges. The inverters and dc combiner boxes are in the inverter structures. The PV arrays will be arranged in blocks with disconnects for each block of PV arrays located at the inverter structures. Through utilization of disconnects, this will disrupt all AC power leaving the inverter structure. However, the PV arrays and all DC powerlines will still be energized during the daytime. If a fire or emergency action is isolated to one block of inverter structures this would not

require de-energizing the entire solar farm. It is important, however, to have a primary disconnect to quickly de-energize the entire PV solar farm in the event that a fire or emergency action involves multiply panels/arrays within the solar farm site. There will be a primary disconnect located at the main service panel to the project site. Also, there would be a primary disconnect for any other power source(s) that may be connected to the solar farm.

Damaged solar panels/arrays should never be touched without verifying whether or not the solar panels/arrays are energized. Firefighters should never cut the wiring in a PV solar farm. Specialized tools may be required for disconnecting the module wiring. Firefighters should consider isolating fires within PV solar farms rather than removing burning material due to the inherent electrical hazard. Solar modules, support structures, tracking assemblies, and conduit should not be disassembled, damaged or removed by firefighters until all of the PV solar farm's components are isolated or de-energized by a qualified PV technician or electrician. Firefighters should limit their activities to containment of the fire until it can be confirmed that the solar farm is isolated or de-energized.

In extraordinary circumstances where all other tactics or options have been exhausted, PV panels must be removed. Care should be taken to use non-conductive tools since the modules and frames may still be energized. Damaged solar farms should not be touched without verifying whether or not the solar farm is energized. Specialized tools may be required to disconnect wiring. Firefighters should consider containing fires within PV solar farms rather than removal due to the inherent hazard and limited electrical safety training afforded to firefighters.

- c. Isolation of the inverters and disconnecting the solar farm from the main electrical panel will be an important task. It is recommended that assistance from a local PV technician be utilized to disable and confirm that all the hazards have been mitigated.

At any incident where PV is present, the IC should designate a "Utilities Group" early to aid in locating and disabling inverter structures and PV solar farm components. This can greatly decrease the electric shock hazard to all crews operating on the fire ground. Firefighters must remember that all PV components must be considered "HOT" during day light. Additionally, in this commercial solar farm, there are likely to be several arrays. Firefighters must be aware that if only a single array is isolated, all of the others will most likely remain energized. Care must be exercised when operating the other energized arrays.

An emergency response plan identifying all tasks and the parties responsible for providing the electrical isolation for emergency responders is recommended. The plan shall include the phone number of a responsible entity who can dispatch a local PV



technician in a timely manner. The phone number shall be displayed on the lighted directory at the entrance and on each inverter structure.

- d. Another priority will be preventing further extension of a fire and isolating it to its area of origin. If the PV solar farm itself is on fire, it must be assumed to be “hot” during daylight. Fire suppression crews should avoid physical contact with PV solar farm components until confirmation by a qualified PV technician or electrician that all power sources have been isolated. It may take time for the technician to respond and locate all of the solar farm controls.
- e. Dry chemical extinguishers should be used to contain or extinguish electrical fires. Water should be used to extinguish any ordinary combustibles under or near the PV solar farm, or if the volume of fire requires its use. If water is used, a 30° fog pattern from at least a 30 foot distance, at 100 psi is recommended.

Full PPE must be used due to the potential toxic inhalation hazard if panels are burning. Fire crews should position themselves upwind and out of any toxic atmosphere.

- f. Ingress and egress will require that gates have an inside measurement a minimum of 24 feet wide and will require a Knox Lock. Existing gates plus any future gates that may be installed on the access roads or fence lines must be equipped with an approved padlock, Knox key box (“Knox” padlock, or “Knox” weather resistant lock box, for use with a “Knox” sub-master key) or “Knox” box electronic access system.
- g. During the overall fire suppression and mop-up phases of an on-site fire, firefighters should avoid all potential electrical hazards until there is confirmation that the solar farm no longer poses an electric shock hazard. Firefighters must avoid inadvertently damaging PV components with their tools.
- h. The IC will need the assistance from a local qualified PV technician to assist with disabling the PV solar farm and confirmation that all of the hazards have been mitigated before an incident is terminated and the scene is turned over to the owner or responsible party.

## **2) Trip, Slip or Fall Hazards**

Firefighters should not step on modules and should be aware of the trip, slip and fall potential around PV solar panel racking, conduit and the modules themselves. Many solar farms include narrow walkways between rows for maintenance access. While these rows are not intended for firefighter access, they may provide an alternative means of egress.

PV systems are comprised of metal, glass, conduit and cable, all of which are slippery when wet.

### **3) Firefighter Inhalation Hazards**

The inhalation hazards from the chemicals inherent in PV modules engulfed in a fire or explosion can be mitigated. firefighters wear their SCBA's and personal protective equipment during a structural firefighting and overhaul operations. It is the decision of the Incident Commander whether or not the emergency constitutes sheltering the population "in-place" downwind of the emergency. Fire or explosion emergencies involving large number of PV arrays, as in this commercial application, may necessitate evacuating downwind of the emergency.

### **4) Battery Hazards**

In some PV systems, batteries are used to store solar-generated electricity. Batteries are used most frequently in off-grid PV systems, although batteries are also used in grid-tied applications to have electricity available in the event of a power failure.

There are no batteries proposed to be used in the Sol Orchard-Valley Center Photovoltaic Solar Farm.

PV modules themselves have no storage capacity. Inverters have capacitors which do store energy; however, the energy within the capacitors is discharged soon after power to the inverters is disconnected.

## **5. SUMMARY**

In a fire incident at this site in which a PV System is involved, firefighters on scene need to be trained in identifying PV systems and the methods to control them. In addition, they must know how to adjust their assessment of the incident involving PV to ensure appropriate actions are applied to the incident. In any incident, the desired outcome is to always mitigate and/or control the situation in a safe and efficient manner

The strategy and tactics firefighters choose are critical to both the outcome and the safety of all members working on the scene. In summary, the basics for ensuring an incident involving this PV site are as follows:

- Always wear protective clothing and SCBA
- Avoid wearing Jewelry

- Use hand tools with insulated handles
- Locate battery storage area (if applicable)
- Be aware that biting and stinging insects could inhabit the module frame and electrical junction boxes
- Lock out/tag out system disconnects should be located and disconnected.
- It is recommended that minimally, the fire emergency responders attend training entitled, “Fire Operations for Photovoltaic Emergencies, CALFIRE-Office of the State Fire Marshal, November 2010. The Fire Service Training and Education Program (FSTEP), provides this specific training need to local fire agencies in California.
- The project site must be signed to accurately identify and locate locations and hazards on the project site. Recommended signage requirements are as follow:
  - Signs to be placed at each disconnecting point and what equipment it de-energizes.
  - Each inverter structure will be numbered with signage that shall be plainly visible with numbers that contrast with their background. Each inverter shall display the phone number of a responsible PV entity who can dispatch a local qualified PV technician in a timely manner.
  - A lighted directory located at the entrance to the site depicting the overall site plan and the locations of each numbered inverter structure (also must be shown on the plot plan) for the site. The directory shall display the phone number of a responsible entity who can dispatch a local PV technician in a timely manner.

The tactical approach to a fire incident near or within a solar farm site must be stressed with all fire suppression personnel (i.e., **stay clear**). Serious injury can occur with a photovoltaic system on a sunny day, and the danger to fire service personnel is real.

At the conclusion of an incident, demobilization and termination efforts should be directed at leaving the property in the safest condition possible. An overall focused size-up and risk-benefit analysis should be conducted.

## REFERENCES

Fire Operations for Photovoltaic Emergencies. CAL FIRE–Office of the State Fire Marshal. November 2010

Fire Fighter Safety and Emergency Response for Solar Power Solar farms. A DHS/Assistance to Firefighter Grants (AFG) Funded Study. Prepared by: Casey C. Grant, P.E. Fire Protection Research Foundation. The Fire Protection Research Foundation One Batterymarch Park Quincy, MA, USA 02169-7471. May 2010